Water & Environmental Research Center

University of Alaska Fairbanks

North Slope Watershed Investigations

WERC-Fact Sheet-03-01

Physical, Biological and Chemical Implications of Mid-Winter Pumping of Tundra Lakes

Project Partners

- GW Scientific
- BP Exploration
- ConocoPhillips Alaska
- Alaska Department of Natural Resources
- U.S. Bureau of Land Management

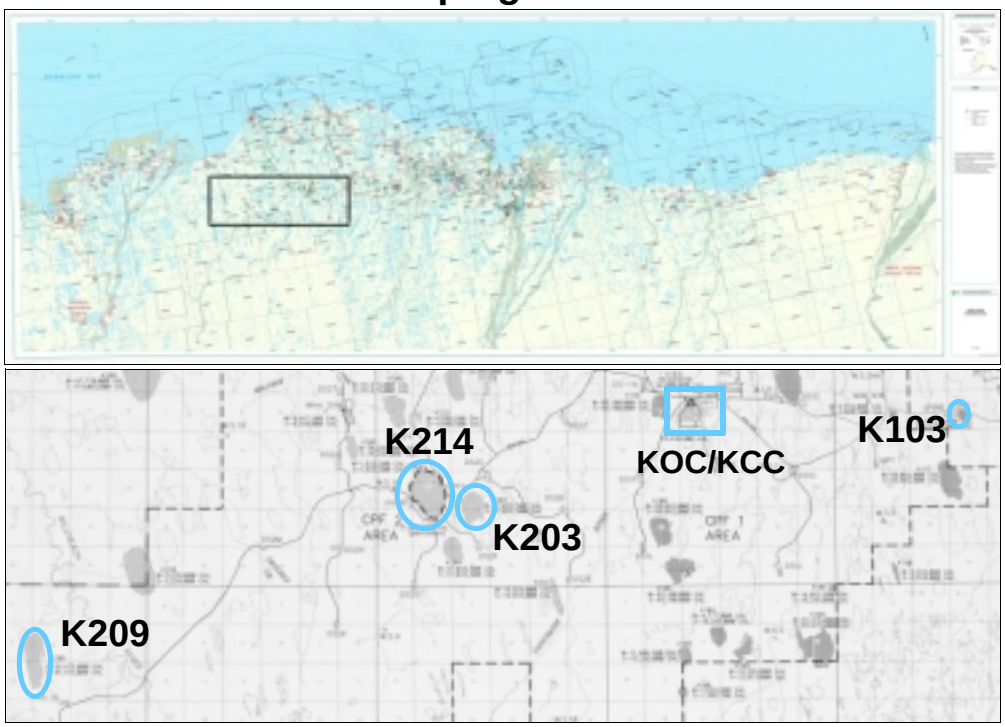

Figure 1. North Slope map indicating current study area (top) and map indicating the four existing monitored lakes (top image — BP Exploration, lower image — ConocoPhillips).

Introduction

For many years, the oil industry and support services have built ice roads and pads for increased access to remote sites with decreased maintenance costs. This technique is quite important to the oil industry in that it allows oil field development or maintenance while avoiding the environmental disturbance associated with construction of gravel roads and pads. Construction of ice-roads and pads begins in December or January when the tundra mat is adequately frozen to support construction traffic and continues through April (depending upon weather). Numerous question remain regarding the potential environmental consequences of such pumping. Possible effects of pumping include impacts to the water balance, impacts to aquatic organisms (including fish and invertebrates), and impacts to the lake water chemistry.

Project Information

In the Fall of 2002, the University of Alaska Fairbanks Water and Environmental Research Center, together with other project cooperators, initiated a study to obtain baseline information about the physical, biological, and chemical characteristics of North Slope tundra lakes in order to help assess some of the major questions related to winter pumping of lakes. Data from the project is available to the public on the web site. Automated data collection stations on lakes provide 15-minute data which is updated on the Internet site at hourly intervals. This project is funded in part by a grant from the U.S. Department of Energy's Arctic Energy Office to the University of Alaska Fairbanks Arctic Energy Technology Development Laboratory (AETDL). Additional funding is provided by project cooperators in the form of financial and in-kind match.

Figure 2. Many North Slope lakes are breeding areas for Tundra Swans (photo – D. Kane).

Project Goals

- *Collect baseline environmental data on pumped and non-pumped tundra lakes*
- *Define hydrologic processes for evaluating tundra lakes pumping evaluations*
- *Initiate distributed modeling of broad area tundra pond hydrologic processes*
- *Determine lake-pumping implications*
- *Provide data and project reporting to project website*

Parameters Monitored

- *Continuous lake water levels and temperature*
- *Continuous specific conductance and dissolved oxygen*
- *Individual measurements of pH, alkalinity, specific conductance, turbidity, ice thickness*
- *Individual measurements of water chemistry parameters: such as Calcium, Magnesium, Nitrate, Potassium, Sodium*

Figure 3. Transporting the hydrologic data collection station to the lake. Stations are designed to float on the lake during the summer months. They are solar powered and data are transmitted to a base station and uploaded to the internet for near real time reporting.

Figure 4: Ice road construction begins when the active layer is satisfactorily frozen. Snow is packed and then pumped water is sprayed onto the snow surface until a sufficient road thickness is attained (photo — W. Morris).

Figure 5. Researchers collect water quality and water chemistry data on a lake during the winter.

For More Information:

If you would like to find out more about this project, visit the following website:

http://www.uaf.edu/water/projects/northslope/lake_recharge/index.html

Or contact:

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